

APPENDIX S -- SFWMD STAFF RESPONSES TO COMMENTS AND FREQUENTLY ASKED QUESTIONS

1. Who is responsible for protecting the river?

Chapter 83-358, Laws of Florida provides guidance regarding authority for protection of the Northwest Fork of the Loxahatchee River. In Section 9, it states that the Florida Department of Environmental Protection (DEP) "shall have full and exclusive authority to adopt rules concerning and to regulate activities within the river area having a direct and substantial adverse effect on any resource value within the river area." Section 9 states further that the South Florida Water Management District Governing Board (SFWMD) "shall have full and exclusive authority to adopt rules concerning and to regulate activities outside the river area having substantial adverse impact on resource values within the river area."

2. What are the resources of the River that need to be protected?

Chapter 373.042, F.S. identifies the need to protect "water resources" during the MFL process. The term "water resource" is used throughout Chapter 373, F.S. Water resource functions protected under Chapter 373, F.S. are broad, as illustrated in Section 373.016, F.S., which includes flood control, water quality protection, water supply and storage, fish and wildlife protection, navigation, and recreation.

3. How will Minimum Flows and Levels Criteria protect the resource?

The overall purpose of Chapter 373, F.S. is to ensure the sustainability of water resources of the state (section 373.016, F.S.) To carry out this responsibility, Chapter 373, F.S. provides the SFWMD with several tools with varying levels of resource protection standards. MFLs play one part in this framework. MFLs are set at the point at which further withdrawals would cause significant harm to the water resources, or ecology, would occur. The SFWMD has defined significant harm as the temporary loss of water resource functions, which result from a change in surface or ground water hydrology, that takes more than two years to recover

4. What are the "considerations and exclusions" that were applied to the Loxahatchee River?

Section 373.0421(1)(a), F.S. requires the water management districts when setting a MFL, to consider changes and structural alterations that have occurred to a water resource. Numerous alterations have occurred in the river and its watershed that have been evaluated during development of these MFL criteria. These alterations were discussed in May 2001 draft of the MFL document.

5. Should a rainfall driven schedule, like that being developed for the Everglades, be developed for the Loxahatchee River to ensure seasonally-adjusted deliveries?

The adoption of a Minimum Flow and Level Rule for the Northwest Fork of the Loxahatchee River is an important step in the development of a series of plans, projects and activities that need to be accomplished in support of this important natural resource. During the development of the Northwest Fork of the Loxahatchee River Restoration Plan the issues of timing of delivery of flows and maximum flows will be addressed.

6. Are there significant water quality issues that need to be considered in this plan?

The Loxahatchee River is an Outstanding Florida Water and therefore has some commensurate water quality requirements. The majority of the known water quality issues that need to be considered in the context of overall watershed management are primarily due to nonpoint source pollution. The SFWMD is participating with other agencies, such as the DEP and the Loxahatchee River District, to address these concerns through establishment of Total Maximum Daily Loads (TMDLs) for appropriate water body segments and through the Environmental Resource Permitting (ERP) process

7. Should development of Minimum Flows and Levels criteria also address the effects of maximum flows?

The adoption of a Minimum Flow and Level Rule for the Northwest Fork of the Loxahatchee River is an important step in the development of a series of plans, projects and activities that need to be accomplished in support of this important natural resource. During the development of the Northwest Fork of the Loxahatchee River Restoration Plan the issue of maximum flows will be addressed.

8. Cypress trees are not particularly good indicators of salinity stress. Other criteria need to be developed that are based on, more sensitive species that respond, and can be monitored, over shorter time periods.

This problem was identified during the peer review process for the May 2001 version of the report. In response to the peer review recommendations, SFWMD scientists conducted additional surveys of resources along the river and identified a freshwater floodplain plant community characterized by adults, seedlings and saplings of six commonly occurring, core sensitive species, of trees and more than 30 associated herbaceous species, a subset of which includes species identical to the "Wild and Scenic" designation. This community is felt to provide a sensitive and effective indicator of the healthy floodplain forest resource that needs to be protected and enhanced in this system

9. The St. Lucie River has been studied in great detail and a very comprehensive plan has been developed to protect and restore this system. Why have so much less time, attention and resources been devoted to the Loxahatchee River?

The St. Lucie River has a long history of problems that have been thoroughly documented and studied during the past forty years. In addition, it has received special attention from the USCOE and SFWMD because it is fed by three major SFWMD Project canals and is a primary outlet of water from Lake Okeechobee. New project facilities (canals and reservoirs) have been proposed for construction in this basin since the 1950's to meet water supply needs of the region. It also lies at the confluence of the Okeechobee and the Intracoastal waterways.

Although Northwest Fork of the Loxahatchee River has some similar issues, much of this system still remains in a largely natural state and its problems are not as severe as those encountered in the St. Lucie Estuary. However, to prevent impacts and protect this important resource, in 1985 significant land acquisition was started and completed in 1991 to place the river corridor in public ownership. Since the 1970's structural and operational improvements have been implemented to direct more flow to the Northwest Fork of the Loxahatchee River. After seven years of data collection, public comment, modeling and analysis the Northern Palm Beach County Comprehensive Water Management Plan was accepted by the SFWMD Governing Board on May

9, 2002. This plan identifies a series of projects that will provide 65 cfs to the Northwest Fork when they are constructed and operational. Implementation of the Northern Plan has been started.

10. The SFWMD always seems to be developing models and does not seem to be doing any real work to solve the problems.

The SFWMD has made a commitment to the use of models as planning and design tools for all major undertakings. Models take time to develop and require a substantial amount of data in order to give relative benefits and impacts of proposed solutions. The advantages are that, once developed, models can be used rapidly and effectively to evaluate wide ranges of options. Although a great deal of modeling effort has been applied to develop models for the portion of the Loxahatchee watershed in northern Palm Beach County, additional work is needed to develop a similar level of modeling tools for portions of the Loxahatchee watershed in southern Martin County. This effort is expected to be completed in 2004.

11. Minimum flow criteria need to be established for wet-season as well for dry-season flows.

This is part of a broader question that is related to restoration and is based on identifying how much of the system needs to be protected and to what extent. The MFL legislation seems to imply the MFLs should be established to identify how much water is needed to protect the resources during extreme low-flow events. Thus it might be useful to define a minimum dry season flow, a minimum wet season flow and also require that some higher levels of flow may be needed to periodically provide flushing or ensure that upper limits of the floodplain are inundated often enough to protect resources that require occasional inundation. It is the intent of SFWMD staff to identify these other needs as part of the restoration plan for the Northwest Fork of the Loxahatchee River.

12. The initial draft (May 2001) of MFL document did not provide a clear separation between scientific and policy decision-making. The choice to declare a certain part of the river as “significantly harmed” is clearly a political rather than a scientific decision.

MFLs require a scientific understanding of the resource and the effects that water conditions have on the resource, but also require the application of judgement to balance among competing impacts. The final decision will inevitably involve some compromise among these impacts and will be determined by the SFWMD Governing Board.

13. Why has the SFWMD reduced its proposed MFL from 70 cfs to 35 cfs during the past year?

The original MFL was based on a number of assumptions concerning the resource that needed to be protected and the conditions that were needed to protect this resource. The peer review panel pointed out that the technical basis used in this original document was not sound. -- that cypress trees were not particularly good indicators of salinity stress, that the downstream-most point at which cypress trees exist along the shoreline may not be directly related to salinity conditions in the river, but may rather be an artifact of groundwater seepage from adjacent uplands, and that there was no sound basis for the chosen threshold (2 ppt) as a condition that might have adverse effects on cypress trees.

14. How were flows to the river managed during the drought event that occurred during the past year and what were the impacts of these flows on resources in the river?

Flows to the Northwest Fork of the Loxahatchee River are managed based on our existing operational protocols for G-92 that require delivery of at least 50 cfs to the Northwest Fork whenever possible. Annual average flows for 2000 and 2001 were below normal but, more

importantly, there were significant periods when flows to the river were below 35 cfs -- in the 10cfs or less range. Flows of less than 35 cfs occurred during approximately five months of each of these two years. During such periods, salt water will generally move upstream to, or above the Trapper Nelson site. Significant harm can occur if such low flow conditions persist. These are the kinds of events that the proposed MFL is designed to prevent.

15. What is the scientific basis that is used to define “harm” and “significant harm” to the resource?

The terms “harm” and “significant harm” are qualitative terms by their nature and do not have objective scientific definitions. Practical definitions of these terms have evolved over the last several years as work has been completed in a number of different ecological systems throughout South Florida.

Serious Harm - refers to long-term, irreversible or permanent impacts that occur during drought event more severe than the 1-in-10 year level of certainty. Declaration of water shortages is the tool that is used by the SFMWD Governing Board to prevent serious harm, pursuant to Chapter 373.246, F.S.

Significant Harm - means the temporary loss of water resource functions, which result from a change in surface or ground water hydrology, that takes more than two years to recover, but which is considered less severe than serious harm (CH. 40E-8.021(24), F.S.)

Harm refers to a measurable damage or impact to a resource that can recover within one year or less.

The interpretation of these terms is specific to each MFL water body and is based on establishing quantifiable relationships between water level or flow conditions and effects on the functions provided by the water resource.

16. What is the “baseline condition” of the resource that is used to determine the extent of harm that has occurred in this system over time?

The baseline condition that was chosen for the establishment of the Northwest Fork of the Loxahatchee River MFL was the condition of the river and floodplain in 1985. At the time that the "Wild and Scenic" River designation occurred there was data available concerning river flow, salinity conditions, and estimated distribution of plant communities.

17. South Florida has only one “Wild and Scenic River.” Is it appropriate to only provide a *minimum flow* needed to protect this system against *significant harm*? The more appropriate management issue is rather how to provide water to the river in sufficient abundance at all times to protect or enhance this unique resource.

The SFWMD recognizes that setting a MFL, according to state law, is not the only basis for overall management of the Northwest Fork of the Loxahatchee River. It is simply one resource protection tool that establishes limits that are expected to be reached only rarely, under severe water shortage conditions. The more important task is to identify the management and restoration needs of the Northwest Fork above the Minimum Flow and Level. The proposed MFL criterion define a flow and an associated duration and return frequencies that represent a small, but very important, component of the total flow regime for the river. The flows that need to be provided during the rest of the time are the important determinants of the overall health and species composition of the floodplain. Development and adoption of a Minimum Flow and Level Rule for the Northwest Fork of the Loxahatchee River is just one important step in a series of plans,

projects and activities to be accomplished for protection and restoration of this valuable resource. A Restoration Plan, led by the DEP with assistance from the SFWMD, will address the broader issues for enhancement and protection of this resource.

18. The MFL seems to only focus on resources in the Northwest Fork of the River. How are resources in the North Fork River and the Loxahatchee Estuary factored into the MFL criteria?

The Northwest Fork of the Loxahatchee River was chosen as the primary focus for MFL development because: a) the designation of the NW Fork as a "Wild and Scenic" river and the associated importance of this river to the state and the nation; b) the presence of infrastructure and facilities to provide and manage flows to the NW Fork; c) most of the watershed of the Northwest Fork is protected through public ownership, therefore, there is no immediate concern that flows from this river are likely to be significantly altered in the future; d) there is no evidence of adverse impacts to the North Fork of the river due to reduced flows; e) there are no facilities to control water flow and distribution in this system; f) the Southwest Fork is highly modified and does not contain significant freshwater-dependent resources.

19. Why doesn't the SFWMD issue a "permit" for the river to protect its use of the resource to a comparable extent that Consumptive Use Permits protect water supplies for other users?

The appropriate method of assuring an allocation of water for protection of environmental resources in the Northwest Fork of the Loxahatchee River is through the "reservation" process. The reservation provides a higher standard of protection than would be afforded by a Consumptive Use Permit. It is a more effective means to balance the environmental protection and restoration needs of the River against the competing needs of public and agricultural water supply.

20. The Northern Palm Beach County Comprehensive Water Management Plan is primarily a water supply plan and provides very little environmental benefit.

The goals and objectives of the Northern Palm Beach County Comprehensive Water Management Plan clearly state that the proposed projects will concurrently meet the projected environmental and urban water supply needs for the year 2020. By 2006, two projects in this plan will be completed, which will achieve the proposed MFL of 35 cfs 94% of the time. When all the projects are completed in 2018, the 65 cfs base flow target will be provided 99% of the time. In addition, the supplemental water will restore the hydroperiod of the Loxahatchee Slough, restore the hydroperiod of the Grassy Waters Preserve, provide increased drainage for the Indian Trail Improvement District, improve the water quality of the Lake Worth Lagoon by reducing stormwater discharges, and meet the 2020 urban and agricultural water supply demands of the area.

21. What is the relationship between the amount of water that is released from Lainhart Dam and the amount of water that is needed to move the salinity wedge to various locations downstream?

The amount of water released from Lainhart Dam is only one component of the total freshwater flow to the Northwest Fork of the Loxahatchee River. Contributions by other tributaries are discussed in Question 34. The proportion of total river flow that occurs from this dam varies seasonally and from year to year depending primarily on local rainfall conditions and secondarily on water management practices in the adjacent watershed. Because of variations in flow from other sources, flow from Lainhart dam shows a relatively poor correlation to salinity conditions downstream. In general, a flow of approximately 35-cfs from Lainhart Dam (when combined

with typical surface and groundwater flows from other basins) is needed to maintain a salinity concentration of 2 ppt at river mile 9.2. A flow of 65 cfs from Lainhart Dam is required to maintain a salinity concentration of 2 ppt at river mile 8.4.

22. How much water are you assuming is to come from groundwater and tributary inflows?

Groundwater flow is known to be an important component of total river flow in this system and more work is needed to gather data and document the relationship. Groundwater flow is generally estimated by adding up the effects of all known surface water flows, comparing this prediction with actual salinity measurements in the river and typical cycles, with the assumption that groundwater flow accounts for the difference between estimated and measured values. The estimated groundwater flow to the river is 40 cfs. The model assumes that the groundwater flow is equally distributed among the four major tributary sub-basins, C-18 Canal and other areas upstream of Lainhart Dam, Cypress Creek/Hobe Groves and Kitching Creek.

23. What are the historic levels of flow that occurred to the River prior to development in the watershed?

Two approaches were taken by the SFWMD to estimate the historic flow into the Northwest Fork of the Loxahatchee River and neither one produced very satisfactory answers. Both methods indicated that average annual flows were in the range from 60 to 100 cfs. However, neither of these approaches could provide adequate predictions of seasonal flows or flows during flood and drought conditions. Additional studies of this question will be undertaken when more detailed modeling studies have been completed.

24. The Northern Palm Beach County Comprehensive Water Management Plan does not adequately address resource management needs in, or potential availability of water from, Martin County.

The Northern Palm Beach County Comprehensive Water Management Plan did not take water resource needs or water availability in Martin County into consideration. However, the plan recognizes that it would benefit the area if that evaluation and analysis were performed and includes recommendations for additional studies. Among many other factors it provided a basis to support for the type of more detailed planning effort that is currently underway in southern Martin County.

25. How much have flows to the river changed during the last century?

Very little data are available to determine what kinds of flows were likely to have occurred in the river 100 years ago. Although the watershed was probably connected to the Everglades during very wet periods, during dry periods, the area that includes the present Loxahatchee Slough was probably the primary source of water to the River. The Loxahatchee Slough Cypress Creek, and Kitching Creek and numerous other smaller tributaries probably provided a substantial amount of flow to the River during dry periods due to flow through channels and groundwater seepage.

Available evidence suggests that freshwater plant communities extended much further downstream in the Northwest Fork of the River than they do today, probably to the upper end of the estuary. The Northwest Fork River channel was probably much narrower and shallower. The Northwest Fork Estuary was probably somewhat saline, at least enough to support the growth of large numbers of oysters. The estuary was probably shallower and had oyster bars or reefs and sandbars strategically located to restrict the flow of saltwater upstream into the River.

26. What other changes have occurred in the river, adjacent waters and the watershed that have caused salt water to move upstream in the Northwest Fork?

Besides minor changes to the flows of the Northwest Fork of the Loxahatchee River that have occurred due to water consumption in upland basins, flows to the river have been more severely altered by the construction and operation of drainage and flood control facilities. In addition, stabilization and improvement of the Jupiter Inlet, removal of oyster bars in the estuary, dredging of channels in the river and estuary to improve navigation and obtain fill, and the cutting of channels through river meanders have all eliminated barriers and provided additional means to allow movement of salt water upstream into the Northwest Fork of the Loxahatchee River.

27. What effects have these changes in flows had on plant communities in the river and the floodplain?

A number of surveys of plant communities along the river have been conducted, beginning in the 1970's. Additional information is available from aerial photographs that were taken in the 1940's, 1950's, 1960's, 1970's and 1980s, 1990s. This information indicates that there has been a progressive decline in freshwater swamp and cypress communities in the watershed and associated upstream migration of mangroves. The most extensive changes appear to have occurred during the period from 1953 to 1985. For example, during this period, in the area from river mile 6.6 to river mile 8.9, coverage of mangroves increased from nine acres in 1940 to 84 acres in 1985, whereas freshwater swamp and cypress declined from 104 acres in 1940 to 15.5 acres in 1985. Comparison of 1984 field data and 1985 aerial photographs with 1995 aerial photographs and field data collected during 2000-2001 indicate that no significant vegetation changes have occurred since 1985.

28. What are the effects of consumptive uses on the ability to provide water to the river?

The limited information available indicates that the effects of consumptive uses in the basin on flows to and through the river are relatively small, on the order of 10 cfs or less. Each application for a Consumptive Use Permit, either a modification of an existing use or a new use, is evaluated on a case-by-case basis. The impacts of additional withdrawals on environmental resources will be thoroughly evaluated during the permit review process. Interactive surface-groundwater models are under development that will allow an evaluation of the cumulative effects of water withdrawals throughout the basin.

The establishment of the Minimum Flow and Level Rule for the Northwest Fork of the Loxahatchee River will certainly be an important factor for consideration of the future withdrawals in the northern Palm Beach County area. Implementation of the Northern Palm Beach County Comprehensive Water Management Plan, which will bring supplemental water to the northern Palm Beach County area, is critical for future water supplies, both urban and environmental.

29. Why does the SFWMD not limit further withdrawals for consumptive use until the MFL criteria are met?

In support of the Minimum Flow and Level Rule for the Northwest Fork of the Loxahatchee River, a Recovery Plan will be developed. It will contain several components, one of which will be a regulatory strategy that will limit the issuance of new Consumptive Use Permits and Environmental Resource Permits in the area.

30. Are the needs of Loxahatchee Slough also being addressed in this Plan?

The needs of the Loxahatchee Slough are not addressed in the Minimum Flow and Level Rule for the Northwest Fork of the Loxahatchee River. However, the Northern Palm Beach County Comprehensive Water Management Plan which is a major component of the Recovery Plan did consider and address the hydrologic needs of the slough. Any additional planning efforts for the Northwest Fork, such as the development of a Restoration Plan, must also include analyses to determine effects on Loxahatchee Slough and other adjacent areas.

31. If MFL criteria are implemented and new facilities are constructed to meet these criteria, what effects will these changes have on actual flows to the river and resources in the river floodplain?

During wet periods, excess water will be captured and stored in reservoirs and ASR wells for subsequent release during dry periods. Damaging high flows to the Northwest Fork of the Loxahatchee River will therefore be reduced in magnitude and duration, thus improving the current seasonal flow pattern. Some preliminary modeling studies have been conducted to determine the effects of proposed water facilities on future flows to the Northwest Fork, but these results are not considered to be representative of actual future water management scenarios. Much depends on how much area is included in the effective watershed boundaries of the basin and how new and existing facilities are actually operated. One way to resolve this issue is to develop a rainfall-driven operational protocol for the river that determines how much water is provided during any period (monthly for example) based on the amount of rainfall that occurs in the watershed during that period and the amount of runoff that would naturally have occurred under those conditions.

32. Neither the IRL feasibility study nor the North Palm Beach County CERP Project adequately address restoration needs of the Loxahatchee River

The base flow target of 65 cfs that was used for the Northern Palm Beach County Comprehensive Water Management Plan was also used as a basis for the initial planning efforts of the North Palm Beach County project of CERP and the Lower East Coast Regional Water Supply Plan. The IRL Feasibility Study was also largely completed before additional needs for delivery of water to the Northwest Fork of the Loxahatchee River were quantified. The North Palm Beach CERP Project can be modified in the future to address water supply needs of the Northwest Fork once these needs have been quantified through development of the Restoration Plan. Some of the options in the IRL study for storage, treatment and conveyance of water south of C-44 Canal, which were initially considered, but rejected, based on their lack of benefits to the St. Lucie River, may be reexamined in the future to determine if they could provide significant benefits to the Northwest Fork of the Loxahatchee River.

33. How much of the overall flow to the river comes from Lainhart Dam and how much comes from other sources. Are you assuming that if you increase flow from the Dam that flow from these other sources will automatically increase proportionally?

Lainhart Dam is generally the single largest source of freshwater inflow to the Northwest Fork, especially during sustained dry periods, although significant amounts of water are provided by groundwater seepage and flow from other tributaries. The flows vary considerably by season. These flows from other sources and tributaries may be especially important during very dry periods. During an average wet season, Lainhart Dam provides 95 cfs of flow to the Northwest Fork. Under average dry season conditions, 70 cfs of flow is provided by Lainhart Dam, 32 cfs from Cypress Creek and 7 cfs from Hobe Groves and 16 cfs from Kitching Creek for a total of 125 cfs. Lainhart Dam represents about 56% of this total. During a more severe dry period, such as the 1989-90 drought, an average of 26 cfs was provided from Lainhart Dam, 30 cfs from Cypress Creek, 7 cfs from Hobe Groves and 1 cfs from Kitching Creek for a total of 64 cfs.

Lainhart Dam represents about 41% of this total. The modeling was based on historic seasonal flows from other basins rather than requiring a proportional increase in flow to match the discharge from Lainhart Dam

34. How will the proposed MFL criteria affect actual operations of District facilities to deliver water to the river? Does establishing this MFL really have an effect on the river or is it simply a “paper tiger?”

The Minimum Flow and Level Rule for the Northwest Fork of the Loxahatchee River will have a Recovery Plan associated with it that will address construction of the structures, regulatory strategies, and operational protocols. The Northern Palm Beach County Comprehensive Water Management Plan will be the major component of the Recovery Plan.

Operational protocols play an important role in the Recovery Plan for the Northwest Fork. Operation of the regional system has been adjusted through the years to deliver water to the Northwest Fork at times and in amounts, so that the present procedures are beneficial to that important resource. These procedures will remain in place until new protocols and facilities, identified in the recovery plan, have been developed. The Recovery Plan will include additional operational improvements, which leverage benefits provided by construction of additional storage facilities, to assure the future health of the Northwest Fork, especially during droughts and prolonged dry periods.

35. As restoration and water resource development projects are implemented, what assurances are provided that any “new water” will be used to enhance flows to the River rather than given away for public or agricultural water supply?

The Mission of the SFWMD is to manage and protect water resources of the region by balancing and improving water quality, flood control, natural systems and water supply. The development and implementation of plans, projects and programs that address protection of current resources and provide for future needs achieve this mission. The mission is also achieved through operation and maintenance of physical facilities and regulatory programs, which effectively distribute and manage available resources.

Regulatory strategies are important part of the recovery plan that supports the MFL for the Northwest Fork of the Loxahatchee River. Several potential regulatory strategies are under consideration to address the integration of Consumptive Use Permitting with Recovery and Restoration Plans.

A Reservation of water to the Northwest Fork is another tool that can be used by the SFWMD to protect “new water” resources from consumptive use allocation. The use of reservations was recommended in the Lower East Coast Regional Water Supply Plan. For the Northwest Fork, a rainfall-driven reservation policy may be most appropriate. An initial reservation could be made to protect of the base condition (existing beneficial flows) and additional water that is produced by water resource development projects could be reserved in a manner that is consistent with the “CERP” process.

36. How does protection of the river from significant harm differ from Restoration of the River?

The MFL defines the amount of water that is needed to prevent significant harm from occurring to the resource. It is anticipated that the MFL only becomes relevant during extreme dry conditions, when flows are well below their “normal” limits. The MFL consists of a flow amount, duration and a return frequency.

Restoration of the Northwest Fork of the Loxahatchee River is focused on long-term sustainability and defines the amount of flow needed to sustain the resource under all hydrologic conditions. If restoration efforts are successful, it is anticipated that the resource will improve over time and that the amount of water needed to protect this improved resource from significant harm will increase. MFL criteria will therefore have to be reviewed periodically to ensure that they are in concert with the state of the resource.

37. Are you going to be evaluating the feasibility of constructing a downstream salinity control/navigational structure as a means of improving freshwater conditions in the River?

This option has been explored in the past and will be given consideration in future studies of the river and watershed.

38. How will new and existing consumptive use permits be affected by the proposed MFL criteria

Possible future regulatory strategies that will be part of the Recovery and Prevention Plan need to address constraints on future permit issuance, re-issuance of existing permits and actions that need to be taken during water shortages. Some of the concepts that have been adopted as a rule for other MFL water bodies including the Everglades include: a) not allowing new or additional direct or indirect withdrawals unless new certified project water is made available for consumptive use permits (CUPs); b) ensuring that any new or additional indirect withdrawals are consistent with the approved recovery strategy. Other uses in the watershed that are shown not have a significant direct or indirect influence on flow to the river would be subject to normal CUP criteria.

39. Once the proposed MFL is being met/achieved in the river, what guarantees will be in place to ensure that CUP permits will not be issued that give away water needed for restoration of the river?

The Basis of Review for Consumptive use permits includes conditions that are designed to protect wetlands and natural river flows from harm due to consumptive use withdrawals. The MFLs provide an additional level of protection that is designed to protect the resource from significant harm caused by additional withdrawals. Water shortage declarations are used as a means to reduce water consumption and the impacts of significant harm and serious harm.

In addition to CUP strategies, the SFWMD is also developing appropriate strategies to address water shortages based on the concept that water restrictions could be imposed on direct or indirect uses when: MFL exceedance occurs or is imminent, and/or climatic conditions are more severe than a 1 in 10 drought. The level of water supply restrictions imposed under such conditions would depend on specific factors in SFWMD rule.

40. If historical drainage has been identified as a cause of reduced flow in the River, will changes be made to existing or future ERP permits in this watershed to address these issues?

As with Consumptive Use Permits, regulatory strategies that address future Environmental Resource Permit criteria may need to be developed as a component of the Recovery and Prevention Strategy for the Northwest Fork of the Loxahatchee River. No changes are anticipated for existing Environmental Resource Permits.

41. What are the elements of the recovery plan, how much water will they provide and when will this water be available?

Even though the currently proposed plan takes 20 years to be fully implemented, substantial benefits occur in a much shorter time frame. A sustained flow of 35 cfs from the G-92 structure into the Northwest Fork can be attained by 2006. Average flows will also increase at that time. Opportunities to provide supplemental flow from other tributaries and basins, including Jupiter Farms, Cypress Creek, Hobe Groves, and Kitching Creek are presently being explored. These inflows may offer additional opportunities to achieve both short-term and long-term flow benefits that contribute to achieving the MFL more quickly and meeting overall river restoration flow requirements in a shorter time frame. The long time necessary to achieve full benefits of the proposed recovery plan is due to the need to acquire additional lands and construct and operate large reservoirs at the Palm Beach Aggregates site and perhaps in the C-18 Canal Basin, and to fully implement technologies such as Aquifer Storage and Recovery that are still in the development and testing stage.

42. A recovery plan that requires 20 years to produce 65 cfs is unacceptable.

Even though the currently proposed plan takes 20 years to be fully implemented, substantial benefits occur in a much shorter time frame. A sustained flow of 35 cfs from the G-92 structure into the Northwest Fork can be attained by 2006. Average flows will also increase at that time. Opportunities to provide supplemental flow from other tributaries and basins, including Jupiter Farms, Cypress Creek, Hobe Groves, and Kitching Creek are presently being explored. These inflows may offer additional opportunities to achieve both short-term and long-term flow benefits that contribute to achieving the MFL more quickly and meeting overall river restoration flow requirements in a shorter time frame. The long time necessary to achieve full benefits of the proposed recovery plan is due to the need to acquire additional lands and construct and operate large reservoirs at the Palm Beach Aggregates site and perhaps in the C-18 Canal Basin, and to fully implement technologies such as Aquifer Storage and Recovery that are still in the development and testing stage.

43. Your analyses suggest that during the next four years, until new facilities can be constructed, that the MFL criteria may not be met on a regular basis. How much additional damage is expected to occur to the resource during this period?

For the foreseeable future, while new facilities are being constructed and after those facilities are in place, the SFWMD will continue to operate the system in the same manner that it has during the past decade. A base flow of 50 cfs will be provided to the Northwest Fork whenever possible and seasonal flows will be conveyed based on rainfall patterns and drainage needs in the basin. These operational protocols, combined with rainfall patterns during the past decades have resulted in a 96% increase in water deliveries to the Northwest Fork between the 1970's and the 1990s. During the 1990's the average daily flow to the river was 102 cfs whereas during the 1970's the average flow was 57 cfs. Available data derived from aerial photography suggest that during the period from 1985 to 1995, there was no additional damage done to the resource in terms of changes in vegetation communities. This information suggests that if current rainfall patterns and operational procedures are maintained, that no *additional* damage to the resource should occur during the next four years while new facilities are being constructed (in 2003-2004) and operations are "ramped up" and fully operational (2004-2006).

44. Does the proposed recovery and prevention strategy, as detailed in the northern Palm Beach County plan, only provide additional water for the river or have additional water supply needs for urban and agricultural use also been considered in this plan?

The Northern Palm Beach County Comprehensive Water Management Plan when implemented is designed to deliver supplemental water to the northern Palm Beach County area. The concept will

provide 65 cfs for the Northwest Fork of the Loxahatchee River, hydroperiod restoration for the Loxahatchee Slough and the Grassy Waters Preserve and will also meet the agricultural and urban water supply needs projected for the year 2020.

In addition, improved drainage for the Indian Trail Improvement District and improved water quality for the Lake Worth Lagoon are also benefits of the plan. The Northern Palm Beach County Comprehensive Water Management Plan is only one element of the MFL Recovery plan. Other elements include interaction with CERP efforts in northern Palm Beach County and the Indian River Lagoon, ongoing investigations in Cypress Creek, Hobe Grove and Kitching Creek Basins, review and modification of operational procedures, regulatory changes and development of a Restoration Plan for the River.

45. Why wasn't restoration of the Loxahatchee River specifically integrated into CERP?

The Restudy and CERP address the Central and South Florida Project, which the Loxahatchee River is not connected to. Therefore, the Loxahatchee was not part of that study domain. Since 1985 the Florida Department of Environmental Protection, Southeast District office and the Park Service staff, the Loxahatchee River Management Coordinating Council and the SFWMD have identified the goal to develop a restoration plan for the Northwest Fork of the Loxahatchee River. The target base flow of 65 cfs, which was incorporated into the Northern Palm Beach County Comprehensive Water Management Plan, was developed over time with assistance of these agencies and organizations.

As the development of the MFL for the Northwest Fork progressed the need to develop a restoration plan for the river was formally identified this past year. A Restoration Plan cannot be developed without specific restoration goals and objectives; therefore, we cannot identify the amount of water that is needed in order to determine the role that CERP might play in providing that water. The SFWMD will be working with DEP in support of identifying a restoration flow target and a Restoration Plan for the Northwest Fork. The SFWMD will work within the CERP process to incorporate the results of these efforts within the North Palm Beach County CERP Project.

46. What is the difference between CERP and the NPBCCWMP? What does one do, beyond the other, which will help the Loxahatchee River?

The NPBC CWMP provides basic infrastructure needed to convey water from the Southern L-8 Basin to northern Palm Beach County. Links between the Grassy Water Preserve, Loxahatchee Slough and the Northwest Fork of the Loxahatchee River will enable the regionally oriented CERP projects to provide more localized benefits to particular resources within the region. The NPBCCWMP projects are, by and large, being implemented in a shorter time period with significant cost sharing by the SFWMD, the state, local governments and private interests

47. The SFWMD acknowledges that the Loxahatchee River has been degraded and that it needs to be restored. Therefore, why isn't the SFWMD doing the "right thing"?

We believe we are doing the right thing for the Northwest Fork of the Loxahatchee River. The role of the SFWMD is not solely an environmental regulatory agency. The SFWMD's missions are to: 1) provide flood protection; 2) provide adequate water supply; 3) protect and improve water quality and preserve and restore natural systems along with their water resource related functions ecosystem management. Specifically, to do the right thing, the SFWMD must determine and manage a balance among these sometimes conflicting four elements. SFWMD Governing Board adoption of a MFL and Recovery Plan, development of a Restoration Plan,

construction of the Northern Plan projects and integration into the North Palm Beach County CERP Project are all currently being developed or initiated

48. Instead of only using science, why isn't the SFWMD using "common sense" to protect and restore the Loxahatchee River?

The SFWMD tries to balance science and common sense. Specifically, Chapter 373.042, F.S. requires water management districts to use best available information in the development of minimum flows and levels.

49. Predictions for the future of South Florida indicate a massive population increase. Specifically, development in northern Palm Beach County and southern Martin County will continue to increase, thereby significantly increasing the demand for water within the Loxahatchee watershed. Do the MFL, NPBCCWMP/CERP, water reservation, and restoration, take into account future water needs? Will there be enough water for the Loxahatchee River in the future?

The Northern Palm Beach County Comprehensive Water Management Plan includes projects that will provide supplemental water to the northern Palm Beach County area in sufficient quantities to meet all projected needs for the year 2020 concurrently, including 65 cfs over the Lainhart Dam to the Northwest Fork of the Loxahatchee River. Please refer to the response to question No. 46.

50. Issues regarding protecting and/or restoring the Loxahatchee River have been voiced to the SFWMD for over 25 years. Why is it that only recently these issues have begun to be addressed by the SFWMD?

The SFWMD has been dealing with this issue for the past 25 years through improvements in water deliveries to the Northwest Fork of the Loxahatchee River. Significant land acquisition in the river corridor and land acquisition in the watershed was completed in 1991. More recently, completion of the LECRWSP in May 2000 and the NPBCCWMP in May 2002 will serve to protect the Northwest Fork. Also, as the CERP, North Palm Beach County Project PIR progresses additional funds will be available to construct projects that will afford more protection for the Northwest Fork. The plans provide a foundation upon which permanent solutions for the Northwest Fork can be developed, such as, G-160 (Loxahatchee Slough structure) and G-161. These facilities, structures and storage areas are necessary to bring supplemental water to northern Palm Beach County.

Under the leadership of the Florida Department of Environmental Protection, with the technical assistance of the SFWMD a Restoration Plan will be developed. A Restoration Plan for the Northwest Fork is critical for the future health of the Northwest Fork.

51. What is the difference between a MFL, a water reservation and hydrologic restoration?

The Minimum Flow and Level is established through a rule and protects water resources from significant harm, especially during long dry periods or droughts. A Water Reservation is another legal process used to establish adequate flows to a water body to meet protection and/or restoration goals and objectives. Both of these tools are used to accomplish hydrologic restoration.

52. Does the SFWMD use a watershed water budget in order to determine how much water is available (a running balance), or can be reserved, for the Loxahatchee River, under different scenarios?

Yes, among other methods. Models developed for the purpose of water management analysis make it possible for different scenarios to be evaluated. The SFWMD will be providing this kind of technical support during the development of the Restoration Plan for the Northwest Fork of the Loxahatchee River.

53. How often will the MFL be updated/revised?

Established minimum flows and levels will be reviewed in conjunction with revisions or updates to the LECRWSP. They will be revised as needed to protect resources in the river based on better information concerning status of the resource or the amount of water needed to protect this resource. The LECRWSP is updated every five years. The next update is due in 2004.

54. Designation of the Northwest Fork of the Loxahatchee River as a National "Wild and Scenic" River is supposed to afford additional protection for the River. In addition, the SFWMD and DEP are the ones charged with providing the additional protection. However, based on this special designation, why isn't the District doing more to protect and restore the river above and beyond a water system that doesn't have the designation?

The additional resource protection needs of this system will be determined through the development of a restoration plan by DEP with assistance from SFWMD. Assurances that these additional needs will be met will be provided through revision of the MFL to protect the restored resources from significant harm and through establishment of water reservations for the Northwest Fork of the Loxahatchee River. Please also see responses for No. 19 and No. 52

55. The SFWMD has not been doing enough to protect South Florida's only Wild and Scenic River

Studies done in the late 1970's and early 1980's identified problems in the Northwest Fork of the Loxahatchee River and Estuary that were attributed to the progressive movement of salt water upstream, resulting in mortality to cypress trees and associated freshwater floodplain communities. These impacts were caused by the deepening, widening and stabilization of the Jupiter Inlet in 1947; dredging of oyster bars and sandbars in the Northwest Fork and the estuary to improve navigation; and construction of the C-18 Canal and subsequent draining of the watershed to allow agricultural and residential development. These changes greatly increased the ability of saltwater to move upstream in the Northwest Fork. Simultaneously, the amount of fresh water that drained from the watershed to provide flow to the Northwest Fork was reduced, especially during dry periods.

Land Acquisition. Immediately after designation of the Northwest Fork as a "Wild and Scenic River," the SFWMD began purchasing land along the river corridor and in the watershed. This land was acquired to protect the natural lands along the river corridor, protect remaining wetlands and natural areas in the watershed, and to provide flexibility to implement future water management options, such as the ability to develop additional storage within the basin. In 1985, approximately 4.8 miles of the 7.5 mile river segment were in public ownership. By 1995, all 7.5 miles of the river corridor had been purchased by the addition of 1,461 acres purchased under the Save our Rivers (SOR) program. An additional 367 acres adjacent to the river corridor was purchased by Palm Beach County. Land acquisition efforts are continuing, to purchase lands that may be used to provide regional water storage (if necessary), but also to establish an interconnected network of natural lands that act as wildlife corridors. Eventually, the goal is to preserve, and provide connections among, Jonathon Dickinson State Park, the Atlantic Ridge, Allapattah Flats, J.W. Corbett Wildlife Management Area, Loxahatchee Slough, Hungryland Slough, the DuPuis Preserve and Grassy Waters Preserve. Presently, approximately 40% of the

Loxahatchee Watershed is in public ownership, with another 5% slated for purchase through the SOR program during the next several years

Establishing Flow Criteria. Following designation of the Wild and Scenic River in 1985, a base flow target of 50 cfs at Lainhart Dam was established as the rate of discharge that was needed to provide a downstream salinity concentration of 2 ppt at the mouth of Kitching Creek. This rate of flow was considered, at the time, to provide an appropriate level of protection for resources in the Northwest Fork. The SFWMD made a commitment to provide that rate of flow or higher, whenever possible. Since that time, the SFWMD has installed new facilities, improved existing structures and changed operational procedures to enhance flows to the Northwest Fork and help meet this target.

Improved Water Deliveries. In addition, the SFWMD has been continually upgrading and improving its facilities and operations to provide more water to the Northwest Fork. The current proposal to establish minimum flow criteria represents the continuation of a process that began in the late 1980's to systematically increase and improve the timing and delivery of flows to the Northwest Fork over Lainhart Dam. Since construction of the C-14 Canal and G-92 structure in 1989, the SFWMD has had improved capabilities to deliver water to the Northwest Fork. Average annual water deliveries across Lainhart Dam increased from an estimated 57 cfs during the period from 1971 to 1979 to 104 cfs during the period from 1990 to 2001. During the period since 1985, recent results from salinity monitoring programs and aerial photographic surveys indicate that further upstream migration of saltwater mangroves has not occurred and the loss of additional freshwater floodplain communities has been curtailed.

Low flow events still occur during extreme dry periods but have been reduced in frequency and duration. The River floodplain can tolerate a certain amount of exposure to salt water if the exposure is not prolonged and if adequate time is allowed between salinity exposures for the plant communities to recover. However, since the 50 cfs flow target cannot be met on a consistent basis, additional infrastructure and operational changes are still needed to provide more flow and begin the restoration process to move the saltwater interface further downstream.

Providing More Water. The District's *Lower East Coast Regional Water Supply Plan*, as approved in May 2000, identified and resolved regional water management issues in Dade, Broward and Palm Beach Counties and the Florida Keys. As part of this planning effort, the need was identified to develop a subregional plan to address local water management issues in northern Palm Beach County. Committees of experts and stakeholders were convened and a base, dry season, restoration flow target of 65 cfs was identified for the Loxahatchee River. The *Northern Palm Beach County Comprehensive Water Management Plan* was accepted by the SFWMD Governing Board in May 2002. It describes the projects, facilities, funding needs, funding sources and cooperating entities needed to meet the 65 cfs flow target. These projects will cost an estimated \$8 million over the next five years. In addition, the Northern Palm Beach County Project of the Comprehensive Everglades Restoration Plan identifies \$435 million in facilities that need to be constructed during the next 20 years to increase storage and improve water distribution in this basin. When construction of these proposed facilities is complete, flows of 65 cfs or more will be provided over the Lainhart Dam to the Northwest Fork of the Loxahatchee River more than 99% of the time.

Minimum Flows and Levels. In 1999, the SFWMD began the process of developing Minimum Flow criteria for the Northwest Fork of the Loxahatchee River. The purpose of the Minimum Flow criteria, as defined in Florida Statutes, Ch. 373, is to protect water resources from *significant harm*. This is a different standard from *restoration* requirements and is intended to define the lowest level of flow that can occur in the river without causing harm that will require

more than two years for recovery to occur. This proposed flow rate provides a management or operational lower limit of flow that can occasionally occur during extremely dry events. As such, it specifies the low flow rate, the amount of time that this flow condition can persist, and how often such events can be allowed to occur.

River Restoration. In conjunction with the process of establishing *minimum* flow criteria needed to protect the resource from *significant harm*, the Florida Department of Environmental Protection (FDEP) has entered into a partnership with the SFWMD to develop an *achievable restoration* plan for the Northwest Fork of the Loxahatchee River. This plan will be based on: a) documentation of historic conditions that existed in the river, floodplain and estuary; b) description of the historic and existing biological, cultural and aesthetic values of the resource; c) consideration of any constraints that have been imposed on the system by human activities; and d) development of “achievable restoration” goals and objectives that characterize how the river and floodplain should look and be managed in the future. It is anticipated that once this future condition has been defined, additional effort will be needed to characterize how much water will be needed to sustain and protect these enhanced resources, potentially resulting in a need to develop new sources of water and to modify the flow targets and MFL criteria for the Northwest Fork

Other Sources of Water. So far, recovery efforts have focused primarily on providing additional water from northern Palm Beach County, through the Loxahatchee Slough and Lainhart Dam to the Northwest Fork. Additional water may also be available from basins in southern Martin County. Investigations are underway in these other basins, especially Pal-Mar and Kitching Creek, to identify and develop other sources of historical supplemental water supply to the Northwest Fork that can be used to provide flow beyond the levels that can be delivered from Lainhart Dam. These studies will provide the basis for determining how much additional water can be provided from the watershed to help meet any future water needs that may be identified for the River in the restoration plan.

- 56. The proposal to establish a flow target of 35 cfs must also consider seasonal flow requirements. Specifically, water deliveries to the river should be directly related or proportional to the amount of rainfall that occurs in the watershed. Furthermore, the minimum flow should not only address the amount of water needed during dry conditions but should also establish an acceptable “minimum” flow for the wet season. These steps are necessary to preserve the natural variability and seasonality of flow patterns that support natural riverine ecosystems.**

The Northwest Fork of the Loxahatchee River must have a natural range of variability of flow in order to protect its ecosystems. Many plant and animal communities depend on seasonal, annual and multi-year cycles of flood and drought for successful reproduction and survival. Flows vary seasonally in response to rainfall and runoff in the surrounding watershed. The challenge is to ensure that adequate supplies are delivered through water control facilities in a manner that simulates these cycles and at the same time avoids unnatural extremes -- excess discharge of flood waters or prolonged periods with little or no water releases. This can be achieved by providing storage facilities that serve a similar function to the natural lakes and wetlands that existed throughout the watershed prior to drainage. During the wet season, excess water is diverted water into storage and released slowly out of these facilities to provide flow during dry periods. Your suggestion to measure rainfall in the basin and use this as the basis to determine appropriate flows to the river is exactly the kind of management approach that we have envisaged. This is similar to the approach that has been proposed and implemented in the past to control deliveries of water to other natural areas, such as Everglades National Park. Such an approach provides a means to ensure that natural cycles of water delivery are maintained and needs to be addressed in the restoration effort.

The proposed MFL recovery plan provides an initial set of facilities that will be used to convey water into the Northwest Fork during dry periods by providing a link to regional storage facilities. In addition, new facilities will be constructed to capture and store water into during wet periods. Much of this water is excess flood water that would otherwise be released to tide through the S-46 structure. Such releases of flood waters create other severe problems in the river, the estuary and the Indian River Lagoon. The proposed recovery plan achieves the initial target of meeting the MFL, to provide flows that remain above 35 cfs, within four years, and continuing with additional projects to eventually provide a sustained flow of more than 65 cfs to the Northwest Fork.

57. What is the purpose for developing Minimum Flows and Levels?

In concept, to halt further degradation of the resource. By definition, the minimum flow and level is not restoration because it only considers the minimum range of flows to prevent significant impact and not the entire range of flows and variability required to sustain a healthy system.

The Minimum Flows and Levels (MFL) criteria were developed to address a particular water management concern -- to establish a "threshold" of flow rate, duration and frequency that should not be exceeded in the Northwest Fork in order to prevent significant harm. Development of the MFL is required by legislation and must meet the legislative requirements as contained in the "Florida Water Resources Act," Sections 373.042 and 373.0421, F.S. Based on experience with the development of other MFLs, the SFWMD has defined significant harm as "... the temporary loss of water resource functions, which result from a change in surface or ground water hydrology, that takes more than two years to recover, but which is considered less severe than serious harm." (CH. 40E-8.021(24), F.S.)

58. What role do Minimum Flows and Levels play in the protection of Florida's water resources?

The MFL is just one of many tools. The proposed MFL's are not a "stand alone" resource protection tool, but should be considered in conjunction with all other resource protection responsibilities granted to the water management districts by law as part of a comprehensive water resources management approach geared towards assuring the sustainability of the water resources. This includes consumptive use permitting, water shortage management, operational protocols, and development of water reservations. In addition, the SFWMD recently completed the *Lower East Coast Regional Water Supply Plan* (May, 2000) pursuant to Chapter 373.0361 F.S., which also includes recommendations for establishment of minimum flows and recovery and prevention strategies. A more detailed *Northern Palm Beach County Comprehensive Water Management Plan* (May 2002) was developed to address specific water supply issues, including the need to provide additional water to the Northwest Fork.

59. How does establishment of a MFL relate to achieving restoration?

The MFL is not intended to achieve restoration. The flow criteria proposed in the MFL document are not intended to restore the river. In accordance with the legislative requirements, the proposed MFL criteria were only developed to protect resources that presently exist in the river from incurring significant harm. Defining the flows needed to preserve and restore the system is a separate process. In the Everglades, we had the Comprehensive Everglades Restoration Plan (CERP) that defined ultimate restoration goals and objectives for the ecosystem and the associated flows and levels that were needed within specific areas of the system to achieve this restoration. When the SFWMD established Minimum Flows and Levels for the Everglades, these levels were often substantially less than the restoration criteria, because they were recognized as

conditions that were needed to protect the system from significant harm and would only occur infrequently during extreme water shortages.

60. I have heard the term “interim MFL” used repeatedly. Once an MFL is established, how and when can it be revised?

The MFL can change over time as the resource improves or additional information becomes available. In the case of the Everglades, for example, MFLs were established based on the current condition of the resource, with recognition that as new facilities are constructed and more water is provided in the future, the resource (Everglades vegetation and soils) is expected to improve. As the resource improves, the levels at which significant harm can occur will also change and the MFL must be reevaluated. Provision is therefore made to review the status of an MFL every five years, during the update of the associated regional water supply plan, to determine if the flows and levels need to be revised. The MFL can, in fact, be revised at any time that additional information becomes available that may affect the criteria. For example, when the “interim MFL” was established for the Caloosahatchee River, a condition of the rule was that additional data would be collected and studies conducted so that the criteria could be reviewed within one year.

61. The MFL criteria seem to be much less than the amount of water needed to fully protect the resource from harm or the amount of water needed for restoration.

The MFL is not a long-term flow target for the river but only applies during infrequent and extreme droughts. The minimum flow criteria, as proposed by the SFWMD, are only allowed to occur under extreme dry events, which can last no more than 20 days, and occur no more often than once every six years. During such events, average salinity at mile marker 9.2 in the river may increase to 2 ppt. However, during the remainder of the time (five out of six years and 340 days during the sixth year). Salinities at this critical location should remain below 2 ppt and fresh water conditions (less than 0.5 ppt) need to occur during the vast majority of the time. Prolonged exposure of the freshwater-forested floodplain community is necessary to keep these plants healthy enough to tolerate the occasional, infrequent, short-duration exposures to saltwater without being killed.

62. What is the process for determining how much water is needed to fully protect or restore the River?

A process for defining restoration needs for the Northwest Fork is presently underway. This larger issue, which is currently being addressed by the Florida Department of Environmental Protection, SFWMD, other agencies and local interests, is the development of a restoration plan for the Northwest Fork. The restoration plan will identify the appropriate balance that needs to be maintained between freshwater and brackish-water environments in this system, the long-term, sustained flow requirements of the river and the seasonality of flows needed to protect the natural flow characteristics of this critical resource. Most importantly, the restoration plan will define projects and facilities that are needed throughout the Loxahatchee River watershed to achieve this flow. So far, the SFWMD has only looked at particular basins in northern Palm Beach County as potential sources. The restoration plan will evaluate the ability to obtain more water other areas in Palm Beach and Martin counties such as Pal-Mar, Cypress Creek, Hobe Groves and Kitching Creek. The water needed to meet the long term restoration flow requirements, protect the natural resource functions and values of the river would be met by establishing a reservation to ensure that the water provided by future projects and activities will, in practice, be used to restore the river.

Presently, FDEP is taking the lead, with technical support from the SFWMD, to establish a framework/pathway to reach consensus on establishing an appropriate MFL for the river. This includes:

- a. The development of an "unconstrained" restoration vision for the river. This was jointly developed by SFWMD and the DEP Division of Recreation and Parks.
- b. Examination of constraints on achieving restoration and development of a "practical restoration goal" that would include the desired flow and any additional work (vegetation manipulation, etc) that may be necessary. This has not been completed.
- c. Deciding what role the MFL "tool" should play in achieving the practical restoration goal.

63. What options does the Governing Board have with respect to establishing a MFL. Must they only consider protection of the resource that exists today or can they seek to protect the resource as it existed in the past or will exist in the future?

The precise choices and responsibilities of the Governing Board in making this determination are not specified in Florida Statute. Based on prior experience concerning actions taken by other water management District's the Governing Board has at least two options as follows:

- a. Establish a "restoration" MFL to protect some future condition of the resource, along with the associated recovery strategy to meet the MFL over time.
- b. Establish an "interim" MFL to protect existing resources, along with a recovery strategy (as needed), with the commitment of the involved agencies to cooperatively to pursue a restoration program that will achieve the practical restoration goal. As the restoration program proceeds, the MFL would need to be revised, or reservations of water adopted to protect the enhanced flows in the river.

64. Once the Technical Criteria document is completed and has been peer reviewed, what happens next?

- Results of the peer review and preliminary public comments are presented to the Governing Board. The Governing Board may choose to make some policy statements directing staff on how to proceed with rule development.
- Staff will develop draft rule language.
- A series of workshops will be held to review the draft rule, solicit input and make revisions to the rule as appropriate. The earliest possible date for a public workshop would be in September - this is based on sending out the required notice to Florida Administrative Weekly three weeks in advance. The draft rule should be available by the workshop date.
- If there are no major re-writes to the rule required then the actual FINAL rule language could go to the November board for authorization to publish the required notice in F.A.W. Once published there can be no changes to the rule language (with a few exceptions), and the time clock for affected parties to challenge the rule starts. IF there are no challenges the rule could then go to the December board for adoption. It would then be filed with the Department of State at the end of December and become effective 20 days after filing - sometime around the end of January.
- If there are any changes to the rule after publication in F.A.W. a notice of change must be published which would set back the effective date about 1 month.

65. There seems to be discrepancy between the amount of water provided for the Northwest Fork by NPBCCWMP, and the amount of water identified in the Loxahatchee MFL report.

The NPBCCWMP focused primarily on meeting regional water supply needs over the next 20 years. These included water needs of major wetland systems (Corbett Area, Grassy Waters Preserve and Loxahatchee Slough), reducing flows to coastal estuaries and increasing flows to the Northwest Fork, as well as providing water for urban and agricultural use through the year 2020. A flow target of 65 cfs was used for the Northwest Fork because, in 1992, it was the best estimate of the amount of water that was needed for the river. The plan stated, however, that a better estimate of water needs for the Northwest Fork would be provided through the MFL process and that flow criteria for the river would be refined when the MFL process was completed. The MFL process is now proposing a minimum flow of 35 cfs as the amount needed to protect the river from significant harm, recognizing that larger flows are needed to achieve restoration.

66. Where is it stated that the SFWMD is committed to provide any more water to the Loxahatchee River than whatever is stated in the MFL criteria?

The LEC Regional Water Supply Plan needs to clearly address this issue in the next update (2005) to provide necessary assurances that the elements of the NPCCWMP will continue to be implemented after 2006 to provide as much additional water as possible towards achieving restoration of the Loxahatchee River,

67. There is also an apparent disconnect between the CERP and the Loxahatchee MFL.

Under federal law, reservations for "new water" for natural systems must be identified for the CERP projects. It is unclear how reservations for the CERP projects, which have not yet been determined, relate to the Northwest Fork, the Loxahatchee MFL or the NPBCCWMP. If an interim MFL is identified, all parties should still realize that CERP reservations should achieve the practical restoration goal, not just the interim MFL. The important first step in this process, therefore, is to develop and quantify the amount of water that is needed to meet the agreed-upon restoration goals and objectives for this system.

68. Design of the Northern Palm Beach CERP projects needs to be investigated and optimized so that they can contribute to the restoration of Northwest Fork.

Once the hydrologic needs for restoration have been quantified, then the CERP projects need to be examined to determine if design changes could be made to maximize the water that they provide to the natural system. Hopefully, this can be accomplished while CERP projects are still in their early design phases. If this opportunity is missed, however, the CERP process still provides opportunities to make further changes to the facilities through the RECOVER process.

69. During the MFL analysis, has the district estimated the amount of time that the flood plain is inundated and the areal extent of inundation?

We have looked into analyzing the extent of flood plain inundation associated with different water levels in the river channel and have found that it is possible to generally estimate this. This analysis would be founded on previous transect surveys across the NW Fork, which have already been conducted. However, there is no (known) measured historical data for surface water elevation (NGVD) from the Northwest Fork, except for the upstream side of Lainhart Dam. The complexity of this type of data arises from the fact that surface water elevations within the river channel will vary along different segments as a function of inflow from each tributary (Lainhart Dam, Cypress Creek, Hobe Grove Ditch, and Kitching Creek) and with tidal force. Without this critical piece of information, flood plain inundation cannot be reliably examined. Future efforts

could include this as part of the development of restoration targets that include water level criteria at different points along the floodplain.

70. When you did the vegetation transects, did you also collect elevation data?

Elevation data were not collected when the vegetation survey work was done. In order to have reliable elevations, a survey crew would need to survey in benchmarks and determine elevation (NGVD) for each site. Relative to the vegetation survey, the elevation changes were not a major factor in the distribution of species, since the widths of all transects were within 25 feet (quantitative survey) to 50 feet (semiquantitative survey) of the river edge and were all roughly at the same elevation. Furthermore, site selection criteria restricted survey locations to the center of the flood plain and not along the edge (near uplands) where the elevation measurably increases.

71. Are the flows that are shown in the tables Mean Flows? How do these flows depicted in the table relate to the duration of 20 days, and frequency of once every six years?"

These rates represent flows which, if sustained for 5 to 9 days on average, will result in average salinity conditions of the given value at the location shown. The frequency and duration criteria were derived by a separate process that looked at conditions that historically occurred at the location in the Northwest Fork where a healthy floodplain community exists. Examination of the simulated mean daily salinity record at this location indicated that events during which salinity exceeded 2 ppt only occurred five times during the 30-year simulation period (once every six years) and that the average duration of such exposures was 20 days.

72. Why are you using a salinity concentration of 2 ppt as the cut off point?

The 2 ppt salinity concentration, as used in this analysis, is a daily mean salinity that is "vertically averaged between the top and bottom of the water column. This is not a particularly useful value from an ecological perspective, but is the kind of output that is produced by our current modeling tools. In other words, salinity could range from 0 to 4 ppt throughout the daily tidal cycle, and from the surface to the bottom of the river, but the mean salinity would be 2 ppt. A mean daily concentration of 1 ppt would indicate that daily salinity concentrations would generally vary from 0 to 2 ppt. Such a value would most likely occur at a location on the Northwest Fork where salinity is 0 ppt during low tide and can reach 2 ppt during high tide. At this site, predominantly freshwater conditions (less than 1 ppt) would occur during the period between high tides. Under these conditions, river channel salinity above 1 ppt would be transient, lasting only a few hours before the next tidal cycle would change back to predominantly freshwater conditions. It is felt that with the flushing of salinity between high tides and the predominance of freshwater conditions, significant harm would most likely not occur when mean daily concentrations occasionally were at 1 ppt. For this reason, 2 ppt (the next integer higher) was a better number to use to define the threshold salinity concentration at which harm could occur. Furthermore, the model used to derive these salinities is not sufficiently sensitive to reliably resolve salinity values to 0.1, or even 0.5; and thus we were more comfortable using whole numbers.

73. If your understory ("key") species are not tolerant of saltwater, wouldn't any salinities greater than freshwater (0.5 ppt) cause significant harm? Do you have any specific references that these species reproduce and thrive at brackish water salinities (>0.5 ppt)?

The Northwest Fork is a dynamic system that is heavily influenced by daily tidal cycles (two high and two low tides per day), occasional and short lived influxes of salinity appear to have not impacted pristine freshwater riverine swamp (as is found at river miles 10.2, 10.4, and 10.6). Most studies in the scientific literature tend to correlate a static (stable) salinity concentration

(often controlled in a laboratory setting) to a type of damage to freshwater plant species. Application of this type of study results must be used cautiously, as transient short-term salinity exposure with recovery/flushing time between events (as is found on the Northwest Fork) will not be comparable to consistent salinity exposure found in controlled experiments.

References cited in the document were obtained from a review of available literature to indicate the general salt tolerance of these species. In most cases, there have been no scientific studies to demonstrate a specific type of plant damage with a specific salinity concentration or exposure time. Mostly, the references were used to indicate that these species are restricted to, or found predominantly in, certain habitat types (freshwater, brackish water, or saltwater) in the natural world. The table was not intended to indicate the degree or extent of salinity tolerance associated with a specific threshold (e.g. >0.5 ppt). In fact, our literature review and results of our field surveys have shown that freshwater species have a range of tolerances to salinity based upon inherent sensitivity of the species, the degree of intra-specific genetic variability, and local conditions.

74. The hydrograph in the technical document shows that flows to the Northwest Fork increased after modifications to G-92. We assume that these are predominantly wet season flows. The dry season flows shown don't really show a corresponding increase in flow as a result of changes to G-92. Can you explain why?

The flows shown in the hydrograph are daily mean flows for the entire period of record. Although flows seemed to have increased during wet and intermediate periods, dry season flows (particularly during drought years) are not significantly enhanced. The G-92 structure is only able to provide flows when sufficient water is available from upstream sources. The fact that dry season flows are not significantly increased underscores the primary problem. The solution is to provide more storage so that additional water can be delivered to augment flows over Lainhart Dam during the dry season.

The District currently operates the system to provide a flow of 50 cfs or more to the Northwest Fork, when available. However, during extended periods of little or no rainfall, flows are reduced, and then eventually must be stopped completely when upstream water levels reach critically low conditions. The construction of the G-160 and G-161 structures, as well as other components of the *Northern Palm Beach County Comprehensive Water Management Plan* (NPBCCWMP), are addressing this issue.

75. If the District were to adopt a MFL with a condition that the flow could not go below for more than, say, 30 days, would this mean that the flow could drop to zero for 30 days or less? If that happened, how far upstream would the salt water extend? Have you done an analysis of the effects of allowing the flow to go to zero for that many days? Have you analyzed the effects of that long a duration of zero flow on the "key" species?

The currently proposed MFL limits flows of less than 35 cfs to not exceed 20 days, once every six years. An analysis of the available historic flow records (30 years, 1971-2001) for Lainhart Dam indicate the following:

- 1) Flows of 5 cfs only occurred during periods when flows were also less than 35 cfs for more than 20 days;
- 2) Over the 30 year period, there were three events when flows fell below 10 cfs -- lasting 10, 8, and 5 days -- during which the MFL was NOT violated. These events had only a short-duration impact on the salinity at upstream sites since there is a several-day "lag" from the time when a drop in flows occurs and salinity increases at an upstream site.

This seems to a pattern that is characteristic of the flow behavior of the basin/river system. These data indicate that the hypothetical scenario you suggest (flows going to zero without a violation of the MFL) has not occurred in the past..

With the G-160 and G-161 structures operational, modeling indicates that an MFL violation would have occurred during only one of the nine years. With all of the NPBCCWMP elements in place, flows would not drop below 35 cfs. The feasibility of obtaining additional water from other sub-basins, such as Cypress Creek and Kitching Creek, is currently being investigated,

76. Has permitting exceeded the ground water resources that would provide 35 cubic feet per second (cfs) in extreme periods? Is there a water budget or is this just a guess?

1. Effects of Permits. The effects of consumptive uses in the watershed have been estimated based on three types of analyses, which indicate that these withdrawals have little effect on the Northwest Fork during normal and above normal rainfall periods. During drought periods, however, they have a measurable, but not especially large, effect on River Flow. Lack of surface water storage capability within the drainage basin, rather than groundwater withdrawal, is the key factor that affects flow to the River.

- a. An inventory of existing water use permits in the watershed was conducted to quantify the amount of water allocated and, where data exist, the amount of allocated water actually pumped, by agricultural, industrial and public water supply utilities, within the watershed.
- b. An interactive surface-ground water model was originally developed for use in the Northern Palm Beach County planning efforts, including the Lower East Coast Regional Water Supply Plan the Northern Palm Beach County Comprehensive Water Management Plan and the Northern Palm Beach County component of CERP. This model was extended and modified to incorporate interaction between ground water and surface water resources. The model incorporates the inflows and outflows that are components of a traditional water budget. Data from Consumptive Use Permits were incorporated in this model to estimate the effects of water use by these permitted facilities on water levels in Loxahatchee Slough and flow from the Slough to the Northwest Fork of the Loxahatchee River.
- c. Data from individual water use permits issued by the SFWMD indicate that public water supply accounts for about 61% of the water allocated in the basin, agriculture accounts for about 19%, Golf course irrigation accounts for 8%, private homes account for 7% and landscape irrigation 5%.

Examination of permitted water use data indicates that about 90 million gallons per day (mgd) (140 cfs) of consumptive use occurs in the Loxahatchee Slough/C-18 Canal basin. Much of this water is pumped from Floridan Aquifer wells or wells that are located a sufficient distance from the River or the slough so that the impacts are minimal. Data from individual permits were examined to identify those facilities that could potentially have direct or indirect impacts on water levels in the Northwest Fork and C-18 Canal and to estimate the effects of each permit.

Surface Water Use. No direct withdrawals occur from the Northwest Fork of the Loxahatchee River (downstream of Lainhart Dam). Three facilities have 3 surface water withdrawals from the C-18 Canal.

Ground Water Use. Only one project causes groundwater drawdown of more than 0.1 ft beneath the Loxahatchee River and five projects result in groundwater drawdowns of more than 0.1 ft beneath the C-18 Canal.

Results of the watershed modeling studies show that those permits that are located close enough to the Loxahatchee River or the Slough to have an effect, result in an estimated reduction of flow from the river on the order of 10 cfs. Of this total, approximately 5-6 cfs is attributed to withdrawals by public water supply utilities and the remainder to self-supplied residential and agricultural water use.

Consumptive uses in the watershed thus have a small but measurable effect on our current ability to meet the proposed 35 cfs MFL criteria. Within four years, when the G-160 structure in the Loxahatchee Slough and the G-161 culverts are completed, the 35 cfs MFL criteria will be met. These new projects are designed to compensate for the effects of consumptive use as represented in the models. Furthermore, the reservations process will provide additional assurance that the system improvements will provide the required amount of flow to the Northwest Fork.

77. Do we know what effect lowering of regional groundwater levels during the dry season will have on water levels in the Loxahatchee River and on net flow to the Loxahatchee River?

The effects of groundwater levels on the Northwest Fork of the Loxahatchee River flow have not been directly studied in this watershed. The United States Geological Survey (USGS) estimated groundwater flow in their studies by measuring surface water flows, developing a water budget for the river and comparing the salinities predicted by the water budget with actual salinities in the river. The measured salinities were lower than the predicted salinities, so the extra fresh water needed to create these salinities was attributed to flow from groundwater and other sources. For the Northwest Fork, this value was approximately 40 cfs for the watershed. There is no apparent difference between wet season and dry season ground water flow, although intuitively one would expect dry season groundwater flow to be less during dry periods.

Our recent hydrodynamic modeling study was based largely on data from the USGS study, compared to more recent flow data from the Lainhart dam, and additional salinity monitoring data obtained from the Loxahatchee River District. This information, in general, indicated that groundwater inflows were of similar magnitude to those defined by the USGS. The hydrodynamic model distributed this 40 cfs flow equally among the four major tributaries --the Northwest Fork, Cypress Creek, Hobe Groves and Kitching Creek -- corresponding to 10 cfs of ground water inflow at each of these locations. It should also be noted that the 35 cfs flow target was developed by incorporating actual field measurements of flow and salinity to calibrate and verify the model, so that localized variations in stream flow and groundwater flow were considered in this process.

78. There was much discussion of the effects of water levels on flora. Is there corresponding information about effects on fauna?

Much of the attention of this effort has been focused on plant communities because these were the primary resources that were identified for protection in the Wild and Scenic River Management Plan. However, the river ecosystem cannot be managed effectively unless all plant and animal communities are considered. The revised technical report will contain additional information about fauna in the river system, especially the threats posed by exotic species, the special needs of threatened and endangered species, the importance and distribution of fishes and macroinvertebrates, as well as a discussion of seagrass and mangrove distribution in the estuary. There is no question that a change in river flow will affect the distribution and balance of estuarine and marine species and their associated food chains. An increase in flow will lead to an increase in nutrient inflows and overall productivity in the system. Choosing the appropriate balance between upstream freshwater productivity (e.g. floodplain forest and freshwater marshes)

and brackish-saline resources (such as mangroves and seagrass beds) is a complex issue that needs to be addressed in the development of an overall ecosystem restoration plan.

79. How accurate is the estimate of the requirement for 35 cfs or the ability to deliver this amount through the structures? Is there a significant difference if the flow is 34 cfs? It may be necessary or desirable to set a safety factor to allow for uncertainties in these estimated values.

Our ability to measure and deliver water into this system is limited. The G-92 structure allows the SFWMD to transfer water from the C-18 Basin to the Jupiter Farms C-14 Canal (managed by the South Indian River Water Control District) and subsequently over the Lainhart Dam. Withdrawals from the C-18 Canal must cease when stages in this canal reach 12.5 ft NGVD, due to effects of lower water levels on the stability of side slopes of the canal. The SFWMD uses a rating curve to measure the flow over the Lainhart dam and into the Northwest Fork of the Loxahatchee River. The opening of the G-92 structure is then adjusted accordingly to obtain the desired flow rate. Records from other inflow points are of limited quality and duration.

The ability of our models to accurately predict flows is also limited by the accuracy of the data and the assumptions that drive the model. The 35 cfs flow is generally considered by staff to be accurate within about 20%. Specifically, the amount of water needed to hold the salinity wedge at a given point in the Northwest Fork varies from day to day, depending on tide and wind conditions as well as the amount of flow that is occurring from other sources. Our ability to deliver a particular flow into the river from Lainhart Dam is accurate to within about 20%. For these reasons, there is not a very high correlation between measured flow across Lainhart Dam and measured salinity levels in the Northwest Fork and this correlation decreases as one moves further downstream.

The proposed flow of 35 cfs represents a river flow that, on average, will maintain mean tidal salinity of 2ppt at the stated location. This represents an average between the bottom and top of the water column, and from high tide to low tide conditions, and thus might represent a range from 0 to 4 ppt salinity, on a given day. This value thus has a built-in margin of error and incorporates consideration of some of the uncertainties noted above, recognizing that the actual daily flow may be more or less than this amount.

The key to making this system work is to use an adaptive management approach to providing flows to the Northwest Fork. Appropriate monitoring and performance measures therefore need to be established for key parameters in the system, including salinity conditions, tributary inflows, groundwater conditions, and plant and animal communities in the floodplain, river and estuary. Implementation of long-term monitoring programs will ensure that these performance measures are achieved. If monitoring data indicate that the flow criteria are not sufficient to maintain the freshwater/saltwater interface at river mile 9.2, then the 35 cfs flow will need to be increased, or other appropriate measures taken.

Finally, SFWMD staff feels that the proposed MFL of 35 cfs represents a significant improvement above and beyond existing conditions. Currently the Northwest Fork receives no flow during the dry season whenever little or no rainfall occurs for an extended period of time. The proposed return frequency (no more often than once every six years) and the duration of exposure to such events (20 days) are deemed to be sufficient to protect existing resources and initiate recovery of the freshwater forest community in areas where this community has been damaged in the past. Equally importantly, it represents the amount of flow that can effectively be provided within the next four years by projects that are presently identified and funded as components of approved plans. Even if a higher MFL were established today, we could not provide any more water any faster with existing resources.